RING BINDER MECHANISM

Field of the Invention

The present invention relates to a ring binder mechanism for binding the sheets of loose leaves, especially to a kind of binder mechanism with improved ring elements which can close tightly.

Background of the Invention

A ring binder is applied to secure loose leaves, such as punched paper, into a file folder or a notebook. It is characterized in that ring elements for securing paper, the ring elements can be opened optionally to add or remove paper, or closed to secure paper, while allow paper to move along them. Generally a lever is provided each on both ends of the binder to move the ring elements between an opened position and a closed position.

Figures 20 and 21 show a ring binder according to the prior art. In the conventional ring binder, end faces 56 of half ring elements 54 form an engagement configuration with a convex portion and a concave portion. When the end faces 56 of the two half ring elements 54 close, the convex portion of the end face 56 of one half ring element engages with the concave portion of the end face 56 of the other half ring element. One disadvantage of this type of engagement configuration is that the end faces can not close tightly and align to each other exactly when two half ring elements close, so that vertical and transverse misalignments for the engagement configuration will occur, as shown in Figures 20 and 21. Owing to the disadvantage that the end faces 56 of the binder engage with each other misalign up and down, paper which bound by the binder can not be turned over smoothly, and even can be torn.

Summary of the Invention

An object of the present invention is to provide a kind of ring binder mechanism that can overcome the above mentioned disadvantages of the prior art so as to enable the ring members close tightly and align to each other exactly and eliminate the vertical and transverse misalignment.

This object is achieved according to the present invention by providing a ring binder mechanism for binding the sheets of loose leaves, the mechanism comprising: a elongated plate that extends longitudinally; hinge plates supported by said elongated plate for pivotal rotating relative to the elongated plate; rings for clasp said sheets of loose leaves, each of the rings comprising a pair of half ring elements, and the pair of

half ring elements being attached on said hinge plates and being movable between a closed position and an opened position via said hinge plates, characterized in that nesting portions of free ends of said pair of half ring elements form a nesting configuration with a concave portion and a convex portion that are symmetrical about an axis line of the cylindrical rods of the ring elements, so that when the pair of half ring elements are in the closed condition, the nesting portions of said pair of half ring elements are aligned to each other and nested together tightly.

Preferably, the nesting portion with a centrally convex portion is formed in a free end of one half ring element of said pair of half ring elements, and the nesting portion with a centrally concave portion is formed in a free end of the other engaging half ring element, said convex nesting portion has an annular conical surface, said concave nesting portion has a conical hole that is formed from its external end surface, a diameter of the conical hole on the external end surface is smaller than that of the cylindrical rod of the half ring element, a cone angle of said conical hole is smaller than that of the annular conical surface of the centrally protruding outwards nesting portion, when the half ring elements are in the closed condition, the connecting portion between the external end surface of the concave nesting portion and the conical hole thereof engages with the annular conical surface of the convex nesting portion, so that the centrally convex nesting portion is nested in the centrally concave nesting portion.

Preferably, the nesting portion with a centrally convex portion is formed in a free end of one half ring element of said pair of half ring elements, and the nesting portion with a centrally concave portion is formed in a free end of the other engaging half ring element, said convex nesting portion has a protruding portion, the protruding portion is connected to a surface of the cylindrical rod of the half ring element via an annulus internal end surface, a diameter of the protruding portion on the internal end surface is smaller than that of the cylindrical rod of the half ring element, said concave nesting portion has a opening that is formed from its external end surface, a diameter of the opening on the external end surface is smaller than that of the cylindrical rod of the half ring element and slightly larger than that of said protruding portion on its internal end surface, when the half ring elements are in the closed condition, the external end surface of the concave nesting portion and the internal end surface of convex nesting portion form a surface-engagement, so that the convex nesting portion is nested in the concave nesting portion.

Preferably, the protruding portion of said convex nesting portion has a conical shape, the opening of said concave nesting portion has a conical hole that is formed from its external end surface and an internal cylindrical hole that is connected to said

conical hole.

Preferably, the protruding portion of said convex nesting portion has a shape that consists of a cylindrical tip and an arc-shaped annular conical base portion, the opening of said concave nesting portion has a conical hole that is formed from its external end surface and an internal cylindrical hole that is connected to said conical hole.

Preferably, the protruding portion of said convex nesting portion has a cylindrical shape, the opening of said concave nesting portion has a shape of an internal cylindrical hole.

Preferably, the nesting portion with a centrally convex portion is formed in a free end of one half ring element of said pair of half ring element pairs, and the nesting portion with a centrally concave portion is formed in a free end of the other engaging half ring element, said convex nesting portion has a protruding conical portion, the conical portion is connected to a surface of the cylindrical rod of the half ring element via an annulus internal end surface, a diameter of the conical portion on the internal end surface is smaller than that of the cylindrical rod of the half ring element, said concave nesting portion has a conical hole that is formed from its external end surface, a diameter of the conical hole on the external end surface is smaller than that of the cylindrical rod of the half ring element and substantially equal to that of said protruding conical portion on the internal end surface, when the half ring elements are in the closed condition, the external end surface of the concave nesting portion and the internal end surface of the convex nesting portion form a surface-engagement, and the conical portion of the convex nesting portion and the conical hole of the concave nesting portion form a engagement, so that the concave nesting portion is nested in the convex nesting portion.

Preferably, the pair of half ring elements of said ring binder mechanism form a circular ring.

Preferably, one half ring element of said pair of half ring elements of said ring binder mechanism has a straight side.

Preferably, two, three, four or more rings are provided in said ring binder mechanism.

Preferably, said rings are made of metal material, and the metal material can be steel.

Preferably, said rings are made of plastic material.

Brief Description of the Drawings

Figure 1 is a top perspective view showing a ring binder mechanism in a closed condition according to the present invention;

Figure 2 is a bottom perspective view showing the ring binder mechanism in Figure 1;

Figure 3 is a top perspective view showing the ring binder mechanism in the opened condition according to the present invention;

Figure 4 is a bottom perspective view showing the ring binder mechanism shown in Figure 3;

Figure 5 is a top exploded perspective view showing the ring binder mechanism in Figure 1;

Figure 6 are a front view, a side view and a back view showing the ring binder mechanism in Figure 1;

Figure 7 is a partial front view of the ring binder mechanism in an opened and unclosed condition according to the present invention;

Figure 8 are a partial front view showing a first embodiment of a ring element of the ring binder in Figure 1 which is in an closed condition and a partial enlarged view showing the nesting configuration in an closed condition;

Figure 9 are a partial front view showing a second embodiment of the ring element of the ring binder in Figure 1 that is in an closed condition, and a partial enlarged view showing the nesting configuration in an closed condition;

Figure 10 are a partial front view showing a third embodiment of the ring element of the ring binder in Figure 1 that is in an closed condition, and a partial enlarged view showing the nesting configuration in an closed condition;

Figure 11 are a partial front view showing a fourth embodiment of the ring element of the ring binder in Figure 1 that is in an closed condition, and a partial enlarged view showing the nesting configuration in an closed condition;

Figure 12 are a partial front view showing a fifth embodiment of the ring element of the ring binder in Figure 1 that is in an closed condition, and a partial enlarged view showing the nesting configuration in an closed condition;

Figure 13 are a partial front view showing a sixth embodiment of the ring element of the ring binder shown in Figure 1 that is in an closed condition, and a partial enlarged view shows the nesting configuration in an closed condition;

Figure 14 are a top perspective view showing another ring binder mechanism in a closed condition according to the present invention, and a partial front view showing the ring element of the ring binder that is in an closed condition;

Figure 15 are a top perspective view showing another ring binder mechanism in

an opened condition shown in Figure 14, and a partial front view showing the ring element of the ring binder that is in an opened condition;

Figure 16 are a top perspective view showing another ring binder mechanism in a closed condition according to the present invention, and a partial front view showing the ring element of the ring binder that is in an closed condition;

Figure 17 are a top perspective view showing another ring binder mechanism in an opened condition shown in Figure 16, and a partial front view showing the ring element of the ring binder that is in an opened condition;

Figure 18 are a top perspective view showing another ring binder mechanism in a closed condition according to the present invention, and a partial front view showing the ring element of the ring binder that is in an closed condition;

Figure 19 are a top perspective view showing another ring binder mechanism in an opened condition shown in Figure 18, and a partial front view showing the ring element of the ring binder that is in an opened condition; and

Figures 20 and 21 are a perspective view and a partial enlarged perspective view showing a ring binder of the prior art respectively.

Detailed Description of an Exemplary Embodiment

In all the above-mentioned figures, the corresponding parts are indicated by corresponding reference numbers.

Now referring to the above-mentioned figures, especially to the Figures 1, 2 and 5, the ring binder mechanism according to the present invention for binding the sheets of loose leaves is generally indicated by 30. This mechanism includes an elongated plate 32 and three rings. The three rings are generally indicated by 34 and used to secure the sheets of loose leaves.

The plate 32 has a shape of an elongated rectangle and has a substantially arc-shaped cross section with a rising portion thereof along its longitudinal direction. The plate 32 has two ribs that extend along the longitudinal direction in the middle thereof. The plate 32 has two substantially opposite longitudinal edges 40 and substantially opposite transverse ends. A bent bottom edge 44 is formed each along both of the longitudinal edges 40 (Figure 2). The elongated plate 32 is made of metal or any other suitable material which has enough rigidity and can provide stable attachment for another parts of the mechanism, while it is light-weight, material-saving and cost-saving. Two holes 46 are provided in the plate 32 (Figure 5) for receiving and attaching a bushing 48 respectively, so that the mechanism can be fastened in a file folder of a notebook. Six additional holes 52 are positioned along the longitudinal edges 40 for

receiving a ring that passes therethrough respectively. Those plates or shells that have other kinds of shapes, including irregular shapes, or those mechanism that are formed in a file folder or a notebook integrally, are all fell into the scope of the present invention.

Each of the three rings 34 comprises two half ring elements 54 that can move between a closed position (Figures 1 and 2) and an opened position (Figures 3 and 4), in which in the closed position each of the ring element forms a continuously closed ring for securing sheets of loose leaves, and in the opened position each of the ring element forms a discontinuously opened ring for adding or removing sheets of loose leaves. The ring element 54 is formed by typically cylindrical rod that is made of a suitable material, such as steel. Although in the shown embodiment the two half ring elements 54 of each of the three rings 34 are both movable, a mechanism that has one movable half ring element and one fixed half ring element is also fell into the scope of the present invention. Furthermore, those kinds of mechanism which have various numbers, such as more than or less than three rings are all fell into the scope of the present invention.

The half ring elements 54 are provided on hinge plates 56 that are supported by the elongated plate 32 (Figures 2 and 4). The hinge plates 56 are provided for a pivotable movement, so as to move the ring elements between the closed position and the opened position. The hinge plates 56 are provided parallelly for attachment and connected parallelly to each other, so that they can pivotably rotate along the adjacent longitudinal edges. Slots 60 are provided in the hinge plates 56 for connecting to the ring elements. Each of the hinge plates 56 has an outer longitudinal edge 62 that is opposite to a fold line (Figure 5). The longitudinal edges 62 are inserted into the corresponding bent bottom edges 44 of the elongated plate 32 respectively. The longitudinal edges 62 can move freely in the edges 44 respectively, so as to make the interconnected hinge plates 56 pivotably rotate. The elongated plate 32 provides a small elastic force to press the hinge plates 56 offset away a common surface position (that is, to face towards the closed position or the opened position). A special control means that is generally indicated by 38 is provided for pivot rotating the hinge plates 56 in a controllable way, so as to move the ring elements between the closed position and the opened position. Figure 6 shows the ring binder mechanism shown in Figure 1 via a front view, a side view and a back view respectively.

The ring elements of the ring binder mechanism according to the present invention will be further described as follows:

Figures 7 and 8 show a first embodiment of nesting portions 156, 156' of the ring element of the ring binder mechanism according to the present invention. As shown in the Figure 8 that is a partial enlarged view, the nesting portions 156, 156' that are in the

closed condition have a central axis line 51. The nesting portion 156 with centrally convex portion along the axis line 51 is formed in a free end of one half ring element 54. A cylindrical tip 150 whose diameter is smaller than that of the cylindrical rod of the half ring element 54 is formed on the top portion of the nesting portion 156 around the axis line 51. The tip 150 is connected to a surface of the cylindrical rod of the half ring element 54 via an annulus conical surface 151. The nesting portion 156' with centrally concave portion along the axis line 51 is formed in a free end of the other engaging half ring element 54. The nesting portion 156' substantially forms a cylindrical hole 152 around the axis line 51. The cylindrical hole 152 has a conical portion in its bottom. The diameter of the cylindrical hole 152 is larger than that of the top cylinder portion of the nesting portion 156, but smaller than that of the cylindrical rod of the half ring element 54. By a conical hole 153 that tapers outwards, the cylindrical hole 152 is connected to an external end surface 154' of the nesting portion 156' at a position adjacent to an external surface of the cylindrical pole. A diameter of the conical hole 153 on the external end surface 154' is slightly smaller than that of the cylindrical rod of the half ring element 54. A cone angle of the conical hole of the centrally concave nesting portion 156' relative to the axis ling 51 is smaller than that of the annular conical surface of the centrally convex nesting portion 156. When the half ring elements 54 are in the closed condition, as shown in Figure 8, the connecting portion between the external end surface 154' of the concave nesting portion 156' and the conical hole 153 engages with the annular conical surface 151 of the convex nesting portion 156, so that the centrally convex nesting portion 156 of the half ring elements 54 is nested in the centrally concave nesting portion 156' of the corresponding half ring elements 54. In this way, the engagement between the two nesting portions is tighter and the problem that the nesting portions are misaligned can be avoided.

Figure 9 shows a second embodiment of nesting portions 256, 256' of the ring element of the ring binder mechanism according to the present invention. As shown in the Figure 9 that is a partial enlarged view, the nesting portions 256, 256' that are in the closed condition have a central axis line 51. The nesting portion 256 with centrally convex portion along the axis line 51 is formed in a free end of one half ring element 54. A cylindrical tip 150 whose diameter is smaller than that of the cylindrical rod of the half ring element 54 is formed on the top portion of the nesting portion 256 around the axis line 51. The tip 150 is connected to a position of an internal end surface 154 of the nesting portion 256 that is adjacent to an external surface of the cylindrical rod of the half ring element 54 via an arc-shaped annulus conical surface 151. The nesting portion 256' with centrally concave portion along the axis line 51 is formed in a free end of the

other engaging half ring element 54. The concave nesting portion 256' substantially forms a cylindrical hole 152 around the axis line 51. The cylindrical hole 152 has a conical portion in its bottom. The diameter of the cylindrical hole 152 is larger than that of the top cylinder portion of the convex nesting portion 256, but smaller than that of the cylindrical rod of the half ring element 54. By a conical hole 153 that tapers outwards, the cylindrical hole 152 is connected to the external end surface 154' of the nesting portion 256' at a position adjacent to an external surface of the cylindrical pole. A cone angle of the conical hole of the centrally concave nesting portion 256' relative to the axis ling 51 is smaller than that of the annular conical surface of the centrally convex nesting portion 256. A diameter of the conical hole 153 on the external end surface 154' is slightly larger than that of the annulus conical surface on the internal end surface 154. When the half ring elements 54 are in the closed condition, as shown in Figure 9, the external end surface 154' of the concave nesting portion 256' and the internal end surface 154 of convex nesting portion 256 form a tight surface-engagement, so that the centrally convex nesting portion 256 of the half ring elements 54 is nested in the centrally concave nesting portion 256' of the corresponding half ring elements 54. In this way, the engagement between the two nesting portions is tighter and the problem that the nesting portions are misaligned can be avoided.

Figure 10 shows a third embodiment of nesting portions 356, 356' of the ring element of the ring binder mechanism according to the present invention. The configuration of the third embodiment is substantially similar to that of the nesting portion shown in Figure 9. The differences is in that: instead of the cylindrical tip and the an arc-shaped annulus conical surface shown in Figure 9, an arc-shaped conical surface 151 is formed on the top portion of the convex nesting portion 356 around the axis line 51. In this way, the risk that paper is torn by the sharp edges of the nesting portions when the paper is added or removed can be eliminated.

Figure 11 shows a forth embodiment of nesting portions 456, 456' of the ring element of the ring binder mechanism according to the present invention. As shown in the Figure 11 that is a partial enlarged view, the nesting portions 456, 456' that are in the closed condition have a central axis line 51. The nesting portion 456 with centrally convex portion along the axis line 51 is formed in a free end of one half ring element 54. A cylindrical tip 150 whose diameter is smaller than that of the cylindrical rod of the half ring element 54 is formed on the top portion of the convex nesting portion 456 around the axis line 51. The tip 150 is connected to a surface of the cylindrical rod of the half ring element 54 via an internal end surface 154 of the convex nesting portion 456. The nesting portion 456' with centrally concave along the axis line 51 is formed in

a free end of the other engaging half ring element 54. The concave nesting portion 456' substantially forms a cylindrical hole 152 around the axis line 51. The cylindrical hole 152 has a conical portion in its bottom. The diameter of the cylindrical hole 152 is larger than that of the tip 150 of the nesting portion 456, but smaller than that of the cylindrical rod of the half ring element 54. The cylindrical hole 152 is connected to an external surface of the cylindrical rod via an external end surface 154' of the concave nesting portion 456'. When the half ring elements 54 are in the closed condition, as shown in Figure 11, the external end surface 154' of the concave nesting portion 456' and the internal end surface 154 of convex nesting portion 456 form a tight surface-engagement, so that the centrally convex nesting portion 456 of the half ring elements 54 is nested in the centrally concave nesting portion 456' of the corresponding half ring elements 54. In this way, the engagement between the two nesting portions is tighter and the problem that the nesting portions are misaligned can be avoided.

Figure 12 shows a forth embodiment of nesting portions 556, 556' of the ring element of the ring binder mechanism according to the present invention. As shown in the Figure 12 that is a partial enlarged view, the nesting portions 556, 556' that are in the closed condition have a central axis line 51. The nesting portion 556 with centrally convex portion along the axis line 51 is formed in a free end of one half ring element 54. A flat top frusto-conical portion 150 is formed on the top portion of the convex nesting portion 556 around the axis line 51. The flat top frusto-conical portion 150 is connected to a surface of the cylindrical rod of the half ring element 54 via an internal end surface 154 of the convex nesting portion 556. The nesting portion 556' with centrally concave portion along the axis line 51 is formed in a free end of the other engaging half ring element 54. The concave nesting portion 556' substantially forms a flat bottom frusto-conical hole 152 around the axis line 51. The frusto-conical hole 152 is connected to an external surface of the cylindrical rod via an external end surface 154' of the concave nesting portion 556'. A cone angle of the frusto-conical hole of the centrally concave nesting portion 556' relative to the axis ling 51 is substantially equal to that of the flat top frusto-conical portion 150 of the centrally convex nesting portion 556, and a diameter of the flat bottom frusto-conical hole 152 on the external end surface 154' is slightly equal to that of the flat top frusto-conical portion 150 on the internal end surface 154. When the half ring elements 54 are in the closed condition, as shown in Figure 12, the external end surface 154' of the concave nesting portion 556' and the internal end surface 154 of convex nesting portion 556 form a tight surface-engagement, so that the centrally convex nesting portion 556 of the half ring elements 54 is nested in the centrally concave nesting portion 556' of the corresponding half ring elements 54. In

this way, the engagement between the two nesting portions is tighter and the problem that the nesting portions are misaligned can be avoided.

Figure 13 shows a sixth embodiment of nesting portions 656, 656' of the ring element of the ring binder mechanism according to the present invention. The configuration of the sixth embodiment is substantially similar to that of the nesting portion shown in Figure 12. The difference is in that: the flat top frusto-conical portion of the nesting portion 556 shown in Figure 11 is replaced with an arc-shaped top frusto-conical portion shown in Figure 13. In this way, the risk that paper is torn by the sharp edges of the nesting portions when the paper is added or removed can be eliminated.

Figures 14 and 15 show another ring binder mechanism according to the present invention that is in a closed condition. The mechanism comprises two rings. One of the half ring elements of each of said rings has a straight side. The nesting portions of the ring elements of the ring binder mechanism also can have the configuration of the above mentioned first to sixth embodiments shown in Figure 7 to 13.

Figures 16 and 17 show another ring binder mechanism according to the present invention that is in a closed condition and an opened condition, respectively. The mechanism comprises four rings. One of the half ring elements of each of said rings has a straight side, similar to Figures 14 and 15. The nesting portions of the ring elements of the ring binder mechanism also can have the configuration of the above mentioned first to sixth embodiments shown in Figure 7 to 13. In addition, those kinds of mechanism which have various numbers, such as more than or less than four rings are all fell into the scope of the present invention.

Figures 18 and 19 show another ring binder mechanism according to the present invention that is in a closed condition and an opened condition, respectively. The mechanism comprises three rings. One of the half ring elements of each of said rings has an inclined straight side. The nesting portions of the ring elements of the ring binder mechanism also can have the configuration of the above mentioned first to sixth embodiments shown in Figure 7 to 13. In addition, those kinds of mechanism which have various numbers, such as more than or less than three rings are all fell into the scope of the present invention.

Because various modifications can be done without departing from the scope of the present invention, it should be understood that all the content that are included in the above description and are shown in the figures is only instructive, while is not limited.